

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR [2014-17]

B.A./B.Sc. THIRD SEMESTER (July – December) 2015

Mid-Semester Examination, September 2015

Date : 16/09/2015

MATHEMATICS (General)

Time : 12 noon – 1 pm

Paper : III

Full Marks : 25

Group – A

Answer **any two** :

[2×4]

- Find the foot of the perpendicular drawn from the point P(1,8,4) on the straight line joining the points A(0,-11,4) and B(2,-3,1).
- Find the equation of the plane which passes through the point (2,1,4) and is perpendicular to each of the planes $x + y + 2z - 4 = 0$ and $2x - 3y + z + 5 = 0$.
- Find the value of m so that the lines $\frac{x-1}{2} = \frac{y-4}{1} = \frac{z-5}{2}$ and $\frac{x-2}{-1} = \frac{y-8}{m} = \frac{z-11}{4}$ may intersect.

Group – B

Answer **any three** :

[3×4]

- Prove that the set of all feasible solutions of an L.P.P is a convex set. [4]
- Prove that the set $\{(x, y) : x^2 + y^2 \leq 4\}$ is a convex set. Draw the geometric figure of this convex set. [3+1]
- Is the feasible solution (1,1,2) of the system
$$2x_1 - x_2 + x_3 = 3$$
$$x_1 + 2x_2 + 3x_3 = 9$$
a basic feasible solution? If not then reduce it to a basic feasible solution. [4]
- Write down the fundamental theorem of L.P.P.
 - Food X contains 5 units of vitamin A and 6 units of vitamin B per gram and costs 20p./gm. Food Y contains 8 units of vitamin A and 10 units of vitamin B per gram and costs 30p./gm. The daily requirements of A and B are at least 80 and 100 units respectively. Formulate an L.P.P to minimize the cost.
- Solve graphically the following L.P.P
$$\text{Minimize } z = 3x + 4y$$
$$\text{Such that } 5x + 4y \geq 20$$
$$-x + y \leq 3$$
$$x \leq 4$$
$$y \geq 3$$
and $x \geq 0, y \geq 0$ [4]

Answer **any one** :

[1×5]

- Evaluate $\int_0^1 \sin x^2 dx$ by Simpson's one third rule correct to four places of decimals.
- Find the real root of the equation $x^3 - 8x - 4 = 0$ by Newton-Raphson method in (3,4) correct to five significant figures.